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10/564,015	05/12/2006	Shinji Shimosaki	0149-053929	4101

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EXAMINER	
SMITH, FRANCIS P	
ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/564,015	SHIMOSAKI ET AL.	
	Examiner	Art Unit	
	Francis P. Smith	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicants' election with traverse of group I in the reply filed on September 15, 2008 is acknowledged. The traversal is on the ground(s) that groups I and II share at least one general inventive concept: introducing two vapors together before application to a substrate. This is not found persuasive because, as Applicants assert, inventions I and II contain a common technical feature of introducing two vapors together before application to a substrate. According to US 4,293,326, it was known in the art at the time of the invention to form a film on a substrate by introducing two vapors together before application to a substrate and therefore the technical feature indicated by applicants does not contribute over the prior art. Thus, the instant application lacks unity.

The requirement is still deemed proper and is therefore made FINAL.

Response to Arguments

2. Applicants' arguments filed September 15, 2008 have been fully considered but they are not persuasive.

Applicants argue that the Hatano reference fails to teach the claimed feature of pre-mixing a vapor of hydrolysable metal compound and water vapor and bringing the mixed vapors into contact with the substrate within 3 seconds. Applicants' attention is drawn to Hatano at col. 3, lines 26-31 wherein a water vapor is sprayed concurrently

with titanium tetrachloride vapor, and therefore would mix such that "the mixed vapors are brought into contact with a substrate for vapor deposition." Hatano does not expressly address bringing the mixed vapors into contact with the substrate within 3 seconds after mixing, however, it is noted that Hatano teaches the same processing steps of introducing the same precursor materials (e.g. hydrolysable metal compound vapor and water vapor) and therefore reaching the substrate with mixed vapors within 3 seconds of mixing is reasonably expected within the teaching of Hatano. Furthermore, **since the steps are the same, the results must inherently be the same, unless they are due to the conditions not recited in the claims.** Moreover, the Tanaka reference was utilized to support a mixing/reaction time of 3 seconds. Hatano and Tanaka are analogous art because they are from the same field of endeavor: producing photocatalytic material. Tanaka teaches a vapor phase process titanium tetrachloride and steam precursors (substantially the same processing steps as the instant application) react for 3 seconds or less [0020]. Furthermore, it has been held that the test for obviousness is not whether the features of one reference may be incorporated into the other to produce the claimed subject matter but simply what the combination of references makes obvious to one of ordinary skill in the pertinent art. *Consult In re Bozek, 163 USPQ 545 (CCPA 1969).* Regarding Applicants' argument that Tanaka does not teach depositing a film, it is noted that Hatano was utilized for this limitation. Furthermore, regarding Applicants' piecemeal analysis of the references, it has been held that one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references. *Consult In re Keller,*

208 USPQ 871 (CCPA 1981). Regarding the argument for combining Hatano and Tanaka, To establish the prima facie case of obviousness and the motivation to combine references comes from "three sources: the nature of the problem to be solved, the teaching of the prior art and the knowledge of persons of ordinary skill in the art", as per *In re Rouffet*, 149 F3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998)

Regarding arguments for claim 2, Terneu was cited to illustrate a coating process whereby the continuously moving substrate is coated. Regarding the limitation of "the two jetted vapor streams meet each other before they reach the substrate," Terneu teaches a hydrolysable metal compound vapor and water vapor supplied in separate streams so that they **come into contact in the vicinity of the substrate**. Therefore, applicants' argument wherein "two vapor streams meeting each other before reaching the substrate is not considered by Terneu" is apparently without merit.

Furthermore, regarding Applicants' piecemeal analysis of the Hatano, Tanaka, and Terneu references, it has been held that one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references. *Consult In re Keller, 208 USPQ 871 (CCPA 1981).*

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1, 5, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over of Hatano et al. (US 5,919,726) in view of Tanaka et al. (US 2002/0106321A1).

For claim 1, Hatano teaches a method for producing photocatalyst material where titanium chloride is brought into contact with a substrate followed by a heat treatment. Specifically, a metal oxide film is formed by vapor depositing a hydrolysable metal compound (i.e. titanium tetrachloride) in the presence of water vapor, which is analogous to a vapor deposition step in which a vapor of a hydrolysable metal compound and water vapor (e.g. previously mixed vapors) are brought into contact with a substrate to form a film of a metal oxide precursor on the surface of the substrate (col. 3, lines 17-31). Then the substrate undergoes a heat treatment in an oxidizing atmosphere that induces hydrolysis with water, liberating HCl while the hydroxyl group binding to titanium atoms releases water and yields titanium oxide (i.e. calcination step in which the substrate is then heated in an oxidizing atmosphere to convert the precursor into a metal oxide) (col. 4, lines 9-34). Hatano, however, does not *expressly state* a three second vapor mixing time. Tanaka teaches the production of ultra fine particulate titanium oxide particles obtained from titanium tetrachloride by a vapor phase process. Specifically, titanium tetrachloride vapor and an oxidizing gas (e.g. oxygen or steam) are introduced into a reaction chamber with a residence time of three seconds or less to ensure the integrity of the deposited metal oxide ([0043], [0046]). Therefore, it would have been obvious to one skilled in the art at the time of the invention to

reasonably expect a three second vapor mixing time (including subsequent deposition onto a surface/substrate) as suggested by Tanaka, within the teaching of Hatano in order to achieve the predictable result of forming a metal oxide film with the reasonable expectation of success

Regarding claims 5 and 8, Hatano teaches forming a metal oxide film using titanium tetrachloride (i.e. a metal chloride, hydrolysable metal compound) to form a photocatalyst on a substrate (see abstract, col. 3, lines 21-31).

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hatano et al. (US 5,919,726) and Tanaka et al. (US 2002/0106321A1) as applied to claim 1 above, and further in view of Terneu et al. (US 4,293,326).

Regarding claim 2, Hatano as modified by Tanaka does not expressly teach injecting jetted streams of the hydrolysable metal compound vapor and water vapor toward a continuously moving substrate such that the vapor streams meet each other before they reach the substrate.

Terneu teaches a process of coating glass substrate whereby a vapor of a hydrolysable metal compound and water vapor are brought into contact in the vicinity of a traveling substrate via gas streams (e.g. vapors are brought into contact with a continuously moving substrate by the injection of jetted streams toward said substrate) to form an oxide film thereon, while avoiding solid deposits from premature reactions within vapor feed passages (see abstract, col. 4, lines 18-50). Therefore, it would have been obvious to one skilled in the art at the time of the invention to utilize separate

vapor precursor streams to introduce reactants above a continuously moving substrate in Hatano/Tanaka's method as taught by Terneu in order to successfully deposit a metal oxide film while avoiding the clogging of chamber parts that would adversely affect film quality and result in chamber malfunction.

7. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hatano et al. (US 5,919,726) and Tanaka et al. (US 2002/0106321A1), and Terneu et al. (US 4,293,326) as applied to claim 2 above, and further in view of Lindner et al. (WO 89/00549).

As per claim 3, Hatano as modified by Tanaka and Terneu teach depositing the metal compound vapor through a coaxial flow nozzle (i.e. multi-orifice nozzle) (Tanaka [0051]). However, Hatano/Tanaka/Terneu does not teach utilizing a slit nozzle or injecting the vapors in a reverse direction with respect to the direction of movement of the substrate.

Lindner teaches a coating applicator system and deposition method for chemical vapor deposition of a metal-containing film on a surface of a substrate. Specifically, the coating applicator contains nozzles arranged in opposing relation to and toward each other at an angle of approximately 30-70 degrees with respect to normal and contain slits of about 5mm (e.g. slit nozzle) (page 9 , lines 30-34; page 18, lines 14-17). A glass substrate may be moved with respect to stationary nozzles 10a and 10b, and thus, a metal compound vapor is injected in a reverse direction with respect to the direction of the movement of the substrate and nozzle 10a (page. 13, lines 1-5; see figure 17).

Furthermore, the angle between the nozzle and the surface of the substrate is adjustable (page 15, lines 21-27). Therefore, it would have been obvious to one skilled in the art at the time of the invention to utilize Lindner's slit nozzle and reverse deposition technique in Hatano/Tanaka/Terneu's method in order to deposit a metal oxide coating while maintaining high jet velocities capable of coating the desirable areas of interest on the moving substrate.

Regarding claim 4, it is noted that processing parameters, such as the angle size with respect to each nozzle and the water vapor flow rate, are result effective. The instant application lacks notification of criticality of a specific angle of a water vapor slit nozzle and a hydrolysable metal compound vapor nozzle, or of a specific hydrolysable metal compound vapor flow rate. The angle of the nozzles will affect the surface area of the substrate to be coated. A larger angle will allow for more coating coverage on the substrate. Regarding the flow rate, the jet velocity will cool the substrate in the coating zone. Too great of a flow rate will cool the substrate substantially and affect deposited film uniformity. Furthermore, the discovery of optimum values of result effective variables in known processes would have been obvious to a person of ordinary skill in the art at the time of the invention in the absence of unexpected results. Consult *In re Boesch and Slaney (205 USPQ 215 (CCPA 1980))*.

8. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hatano et al. (US 5,919,726) and Tanaka et al. (US 2002/0106321A1) as applied to claim 5 above, and further in view of Novak et al. (US 4,261,722).

For claim 6, Hatano as modified by Tanaka teach utilizing titanium chloride as the metal chloride and a calcination temperature of 100-900°C (Hatano: col. 4, lines 9-27). However, Hatano/Tanaka does not teach of substrate temperatures in the vapor deposition step of 150-250°C.

Novak teaches a method for applying an inorganic coating to a glass surface utilizing titanium chloride and water vapor whereby the temperature of the substrate may be in the range of 150-700°C to avoid iridescent coatings associated with high temperature substrates (col. 5, lines 1-12). Therefore, it would have been obvious to one skilled in the art at the time of the invention to utilize Novak's substrate temperatures in Hatano/Tanaka's method in order to successfully form an inorganic metal coating on a heated substrate, while avoiding the formation of thick iridescent coatings that result from excessively high substrate temperatures.

As for claim 7, Hatano/Tanaka/Novak does not specify a particular $TiCl_4/H_20$ ratio. Generally, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/F. P. S./
Examiner, Art Unit 1792

/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 1792